

## LA-UR-15-29009

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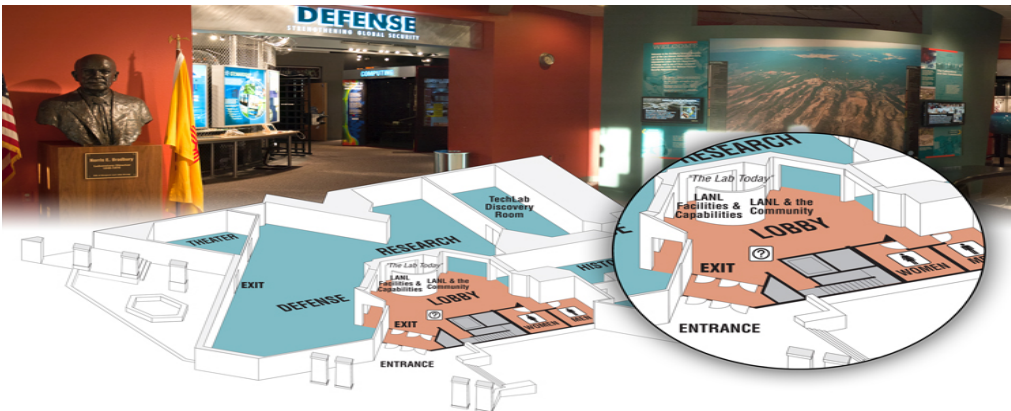
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# Meeting Overview

- Administrative Remarks
- Agenda
- Welcome!





# Overview of Bioscience at Los Alamos

Elizabeth Hong-Geller

Acting Deputy Bioscience Division Leader

October 22, 2015

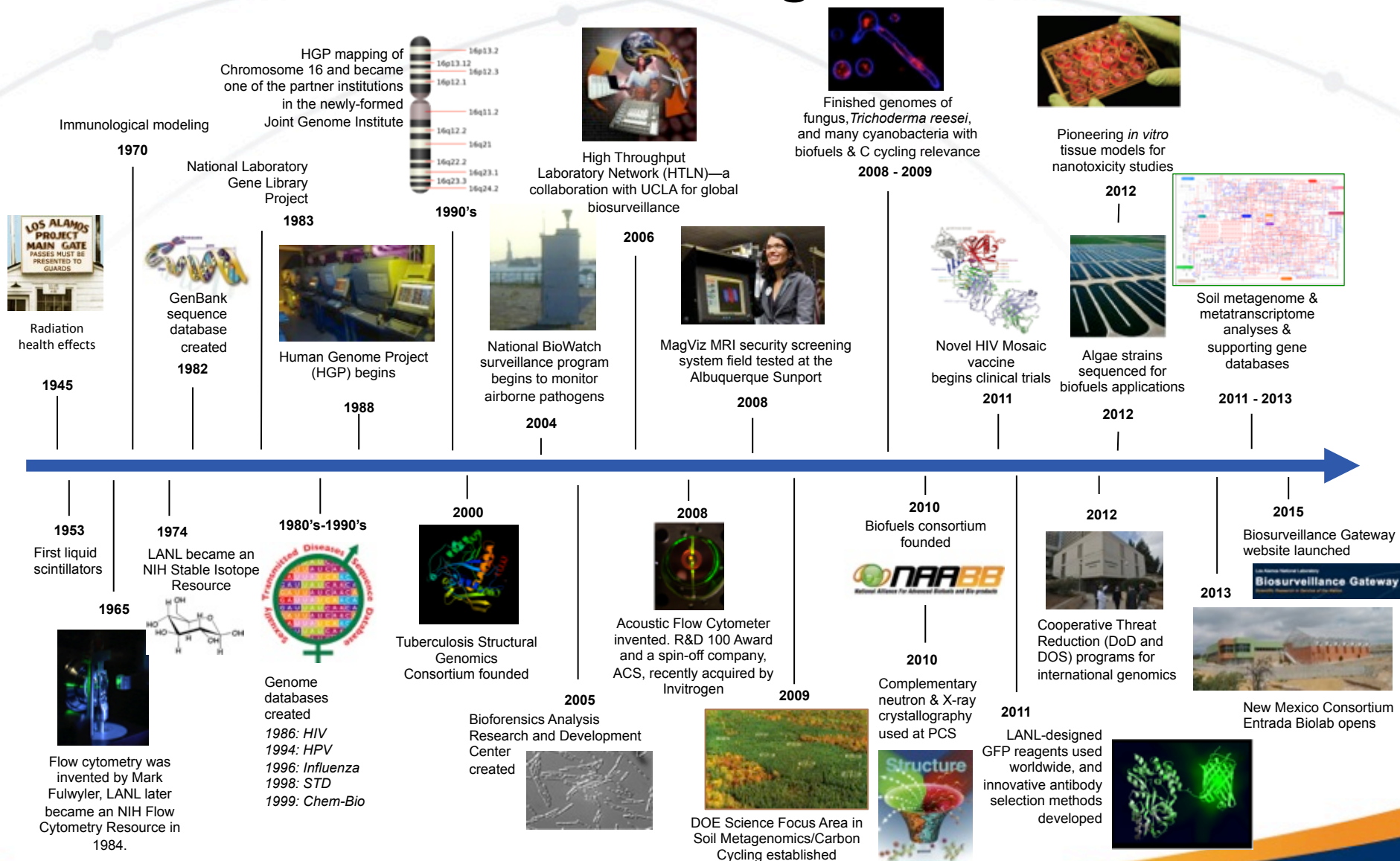
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# LANL Contributions to Biological Science



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# The Bioscience Capability

- Spans 9 Laboratory Divisions and 13 Groups
- Comprised of multi-disciplinary scientists with a broad skillset
  - Biologists, chemists, physicists, computer scientists
  - Experimentalists, theorists, modelers

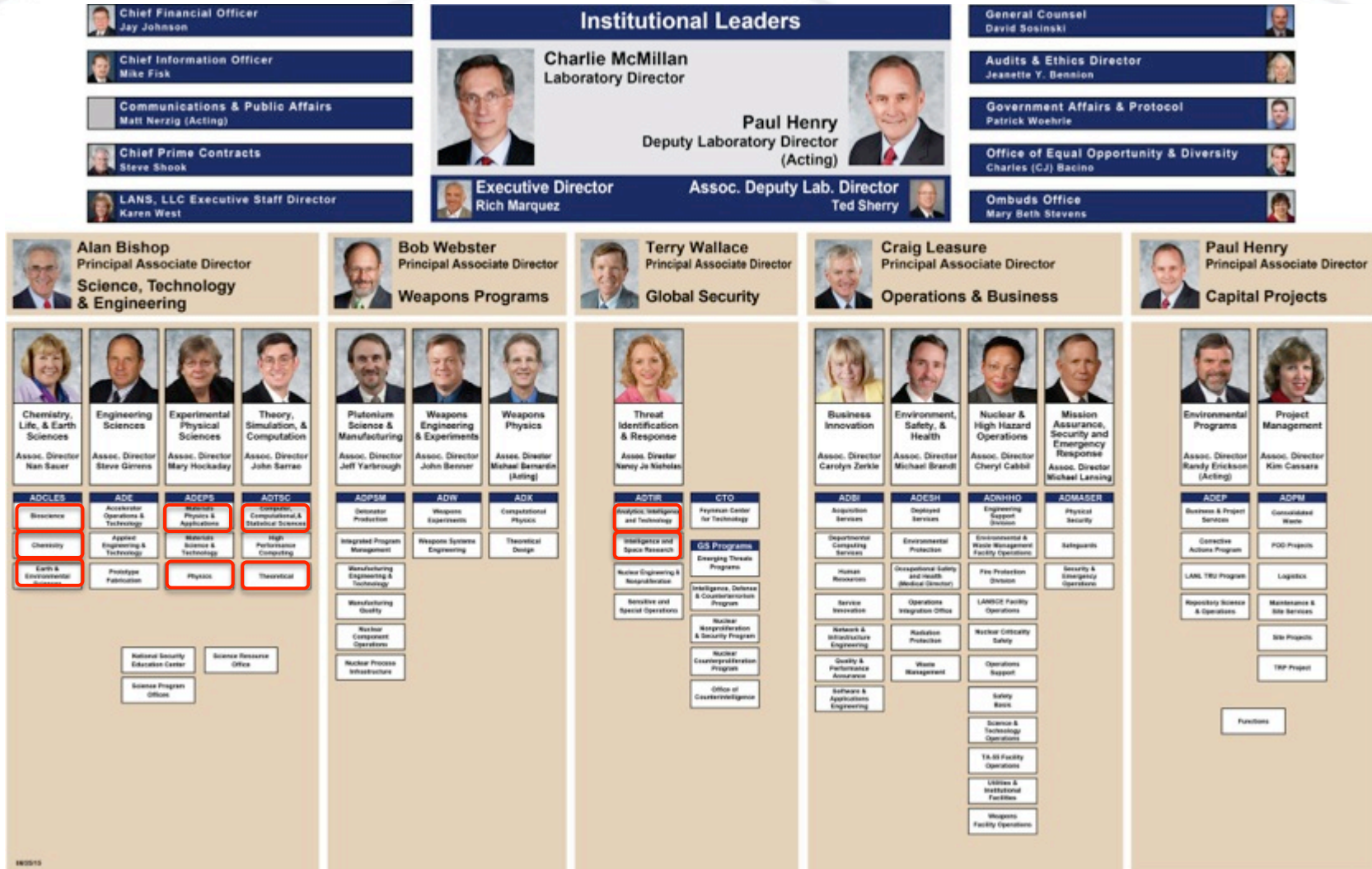


- Research supported by multiple agencies
  - NIH
  - DOD-DTRA, DARPA
  - USDA
  - DOE-BER, EERE, NNSA, EM
  - Department of State
  - DHS
  - CRADA's with industry

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# Bioscience spans 9 Divisions across LANL



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# Resources and Collaborations

- **Interdisciplinary capabilities at Los Alamos**

- Center for Integrated Nanomaterials
- Advanced Tissue-engineered Human Ectypal Network Analyzer (ATHENA)
- Genome Institute of Los Alamos (GILA)



- **External partnerships**

- New Mexico Consortium
- National Advanced Biofuels Consortium
- University of New Mexico Cancer Center
- TB Structural Genomics Consortium



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# Bioscience @ LANL

Public Health

Bioenergy



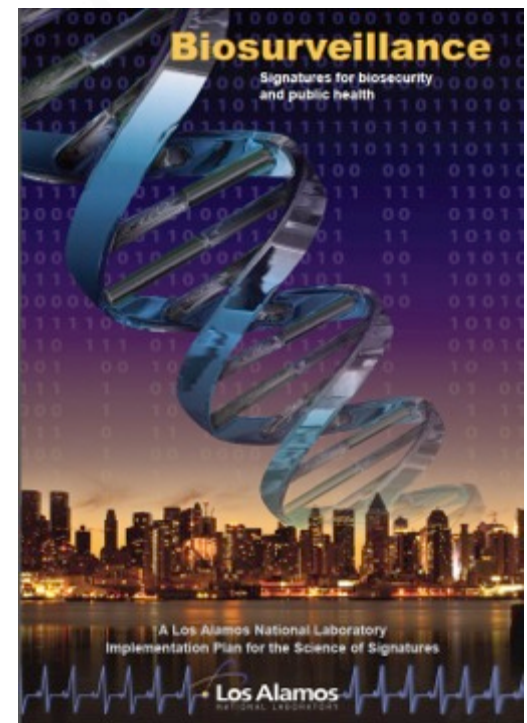
Environmental Science

Biosecurity

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# Biosurveillance Initiative

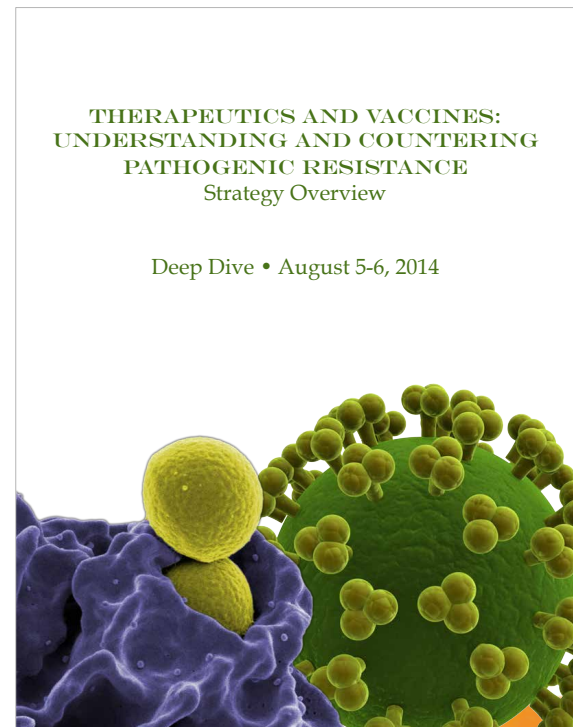
- Expertise in epidemiology, modeling, detection technologies, and host-pathogen studies gives LANL a unique set of capabilities to apply to biosurveillance
- National Strategy for Biosurveillance published in 2012
- Los Alamos has hosted 4 Biosurveillance conferences since 2006
- Current research:
  - Epidemiological studies and predictive modeling
  - New detection strategies and diagnostics
  - Phylogenetic analysis of pathogens and signature development
  - Global genome centers and bioinformatics training
- Biosurveillance Gateway website
  - BRD, EDGE, BARD, pathogen databases, Sequedex, SWAP



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# Advanced Therapeutics Initiative

- Long-standing capabilities at Los Alamos provide the basis for enhanced vaccine development, new antibiotics, and novel therapeutic strategies
- National Strategy for Combating Antibiotic Resistant Bacteria published in 2014
- Current research:
  - Understanding pathogen defense systems such as persistence and efflux pumps
  - Vaccine design for highly variable pathogens (HIV, Ebola)
  - Novel strategies for finding new antibiotics
  - Host-pathogen relationship studies



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# Systems Biology is a theme throughout

- Systems biology permeates all bioscience research at Los Alamos
  - Examining biomes at multiple scales to understand climate impacts
  - Integrating knowledge of an organism's genome, transcriptome, and proteome to enhance biofuel production
  - Understanding host-pathogen relationships, disease progression, and phylogenetic relationships among pathogen strains to combat disease



Graphic credit: DOE-Joint Genome Institute  
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**Division and Institutional Program  
Development and Management**

**Global  
Security**

(DTRA, DHS, IC, NIH)

**Energy  
Security**

(Applied Energy Office)  
(Office of Science)

**Bioscience Division**

**Bioenergy and Biome  
Sciences**

Bioinformatics and Analytics

Genome Technologies

Biomass and Biodiversity

Biophysical Chemistry

**Biosecurity and Public  
Health**

Biosurveillance

Molecular Recognition & Design

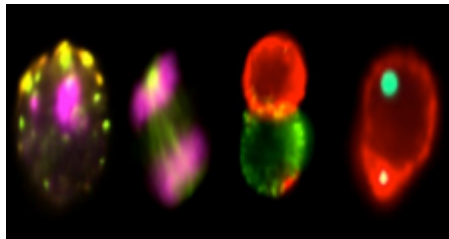
Bioengineering, Protein Design, Structure, and  
Evolution

Pathogen Science

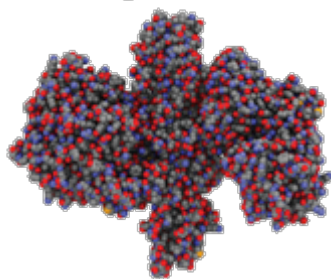
# Biosecurity and Public Health Group (B-10)

## Teams:

- Bioengineering, Protein Design, Structure, & Evolution
- Biosurveillance
- Molecular Recognition and Design
- Pathogen Science

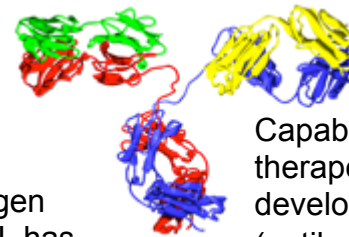
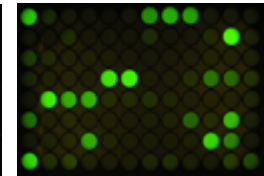
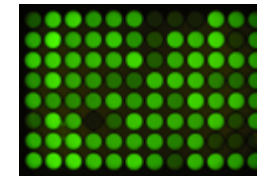
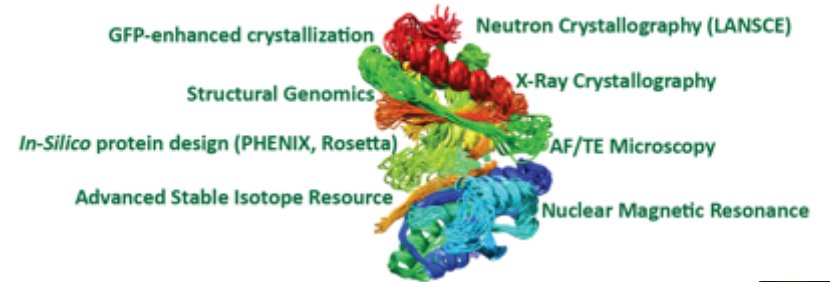


Host pathogen studies include functional validation of sRNAs in virulence (pathogen) or immune response (host)



Evolution and attribution of different pathogen species by sequencing. For instance, LANL has characterized 1100 strains of *C. botulinum* from infant botulism cases (40 years)

## Capabilities for Comprehensive Protein Structure Determination



Capabilities for biosurveillance or therapeutics development such as the development of recognition ligands (antibodies) for detection or the identification of drug targets through protein structure analysis or host-pathogen studies.

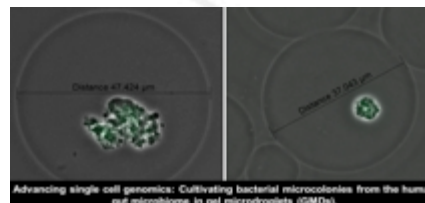
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# Bioenergy and Biome Sciences Group (B-11)

## Teams:

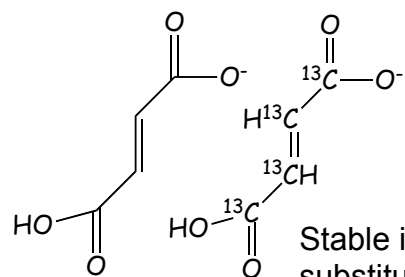
- Genome Technologies
- Bioinformatics and Analytics
- Biomass and Biodiversity
- Biophysical and Synthetic Chemistry



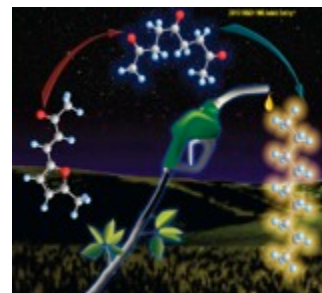
A leader in genomics for decades, LANL continues to develop advanced sequencing strategies and novel bioinformatics techniques to benefit all areas of biological research.



Soil metagenomics and microbial carbon cycling in terrestrial ecosystems



Stable isotopes can be substituted in biomolecules for tracing and measurement or for detection within biological systems.



The next-generation of biofuels is being developed at Los Alamos.

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